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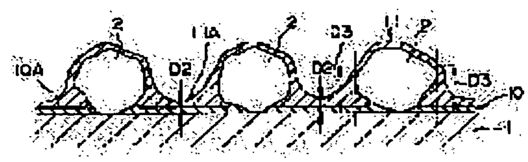
## (54) ELECTRODEPOSIT GRINDING WHEEL AND MANUFACTURE THEREOF

(57)Abstract:
PURPOSE: To improve the chip dischargeability by forming chip pockets on the surface of a metal plating layer to hold super-abrasive grains.
CONSTITUTION: An electro deposit grinder is provided with super-abrasive grains 2 fixed on the abrasive grain forming surface of a base metal 1 in a single layer mode through metallic plating layers 10, 11, and the metallic plating layers 10, 11 have the average thickness D3 of 50-90% of the average grain size of the super-abrasive grains 2 on the peripheral edge part of the individual super-abrasive grains 2 seen from the direction normal to the abrasive grains layer forming surface, and at the same time, the average thickness D2 of the intermediate part of the adjacent super-abrasive grains is set smaller than the average thickness D3 on the peripheral edge part by more than 30% of the average grain size, preferably in the range over 10% of the average grain size.

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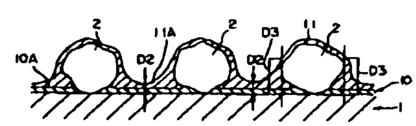
(54)【発明の名称】電着砥石およびその製造方法

(57)【要約】

【目的】　超砥粒を保持する金属めっき相の表面にチップポケットを形成し、切粉排出性を高める。

【構成】　台金１の砥粒層形成面に超砥粒２を金属めっき相１０，１１を介して単層状に固着させた電着砥石であって、金属めっき相１０，１１は、砥粒層形成面と直交する方向から見た個々の超砥粒２の周縁部で超砥粒２の平均粒径の５０～９０％の平均肉厚Ｄ３を有し、かつ隣接しあう超砥粒２の中間部分の平均肉厚Ｄ２は、好ましくは平均粒径の１０％以上になる範囲において、周縁部での平均肉厚Ｄ３よりも平均粒径の３０％以上小さく設定されている。



【特許請求の範囲】

【請求項１】　台金の砥粒層形成面に超砥粒を金属めっき相を介して単層状に固着させた電着砥石であって、前記金属めっき相は、前記砥粒層形成面と直交する方向から見た個々の超砥粒の周縁部で超砥粒の平均粒径の５０～９０％の平均肉厚を有し、かつ隣接しあう超砥粒の中間部分の平均肉厚は、前記周縁部での平均肉厚より前記平均粒径の３０％以上小さいことを特徴とする電着砥石。

【請求項２】　台金の砥粒層形成面に多数の超砥粒を分散させるとともに、この砥粒層形成面に、電解めっき法または無電解めっき法により超砥粒の平均粒径の０．３～２０％の肉厚を有する下地金属めっき相を形成して超砥粒を単層状に固着させ、さらにこの下地金属めっき相の表面および超砥粒の露出面に表面触媒化処理を施した後、無電解めっき法を用いて下地金属めっき相および超砥粒の表面に上地金属めっき相を形成することを特徴とする電着砥石の製造方法。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明は、台金に超砥粒を金属めっき相で固定した電着砥石およびその製造方法に係わり、特に、金属めっき相の表面にチップポケットを形成し、切粉排出性を高めるための改良に関する。

【０００２】

【従来の技術】図４は、従来の電着砥石の一例を示す砥粒層の断面拡大図である。図中符号１は各種形状の台金であり、この台金１の砥粒層形成面１Ａには、金属めっき相３を介して単層状に多数の超砥粒２が固着されている。

【０００３】金属めっき相３を形成するには、電解めっき法または無電解めっき法が使用される。電解めっき法による場合には、砥粒層形成面１Ａを除いてマスキングを施した台金１を電解めっき液内に浸漬し、砥粒層形成面１Ａの少なくとも一部を上向きかつ水平に配置する。そして、この水平面に超砥粒２を撒き、台金１を電源陰極に接続するとともに、前記水平面と対向配置された陽極との間で通電し、金属めっき相３を析出させて超砥粒２を固定する。

【０００４】この操作を、台金１を動かしながら砥粒層形成面１Ａの全周に亙って繰り返し、単層状の砥粒層を均一に形成する。無電解めっきを使用する場合にも、めっき液として無電解めっき液を使用し、陽極は使用しない点を除き、上記同様の操作を行なう。

【０００５】なお、いずれの場合にも、金属めっき相３の肉厚は通常、超砥粒２の平均粒径の３０～７５％程度に設定される。この肉厚が３０％未満では十分な砥粒保持力が得られず、超砥粒２が研削中に無駄に脱落して超砥粒の使用効率が低下する。また７５％より大では、金属めっき相３からの超砥粒２の突出量が小さすぎ、被削材への超砥粒２の食い込み量が不足して切れ味が著しく低下するという問題が生じる。



【０００６】

【発明が解決しようとする課題】しかし、上記のような電着砥石では、金属めっき相３の表面３Ａが緻密かつ平坦であるため、研削中に生じた切粉を、砥石の運動につれて研削部分から排出する効果（切粉排出性）が小さい。特に、超砥粒２が摩耗して金属めっき相３からの突出量が小さくなると、超砥粒２が目詰まりして切れ味が極端に低下して、研削抵抗が急激に増大し、その分、砥石の使用寿命も短いという欠点があった。

【０００７】

【課題を解決するための手段】本発明は上記課題を解決するためになされたもので、まず本発明に係わる電着砥石は、台金の砥粒層形成面に超砥粒を金属めっき相を介して単層状に固着させ、前記金属めっき相は、前記砥粒層形成面と直交する方向から見た個々の超砥粒の周縁部で超砥粒の平均粒径の５０～９０％の平均肉厚を有し、かつ隣接しあう超砥粒の中間部分の平均肉厚は、前記周縁部での平均肉厚よりも前記平均粒径の３０％以上小さいことを特徴としている。

【０００８】また、本発明の製造方法は、台金の砥粒層形成面に多数の超砥粒を分散させるとともに、この砥粒層形成面に、電解めっき法または無電解めっき法により超砥粒の平均粒径の０．３～２０％の肉厚を有する下地金属めっき相を形成して超砥粒を単層状に固着させ、さらにこの下地金属めっき相の表面および超砥粒の露出面に表面触媒化処理を施した後、無電解めっき法を用いて下地金属めっき相および超砥粒の表面に上地金属めっき相を形成することを特徴としている。

【０００９】

【作用】この電着砥石およびその製造方法によれば、隣接する超砥粒の間で金属めっき相の表面に凹部が形成されているため、この部分がチップポケットとなって砥石の運動とともに切粉を研削部から排出し、高い切粉排出性が得られる。したがって砥粒層が目詰まりしにくく、砥石の稼動率および砥石寿命を延長することが可能である。

【００１０】また、砥粒層形成面と直交する方向から見た個々の超砥粒の周縁部において金属めっき相が盛り上がり、超砥粒を包み込んでいるため、金属めっき相の実質的な肉厚が小さくても砥粒保持力が大きく、研削中の砥粒破砕および砥粒脱落が少ない。さらに、超砥粒の研削に直接関与する刃先以外の部分は全て上地金属めっき相に包まれているので、刃先で発生した熱は、上地金属めっき相を通じて速やかに台金に逃され、乾式研削等に使用した場合にも超砥粒の過熱が防止でき、冷却性が良好である。

【００１１】

【実施例】図１ないし図３は、本発明に係わる電着砥石

の製造方法を示し、図中符号1は台金、2は超砥粒である。

【0012】この方法ではまず、図1に示すように、砥粒層形成面1Aを除く部分にマスキングを施した台金1をめっき槽内にセットし、砥粒層形成面1Aに多数の超砥粒2を分散させる。そして、この面1Aに、前述した従来法と同様に、電解めっき法または無電解めっき法により下地金属めっき相10を析出させて、超砥粒2を単層状に仮固定する。

【0013】下地金属めっき相10の材質としては、Ni, Co, Cu, Znなどが使用可能で、その肉厚D1は超砥粒2の平均粒径の0．3～20％、より好ましくは5～10％とされる。本発明者らの実験によれば、肉厚D1が0．3％より薄いと超砥粒2を仮固定することができない。また、20％より厚いと後述するチップポケットの形成が不十分になり、目詰まり防止効果が低下する。

【0014】なお、隣接しあう超砥粒2同士の平均間隔Wは、超砥粒2を台金1上に撒いて電着する方法を採った場合、超砥粒2の平均粒径の0．7～1．5倍程度の範囲に収まる。

【0015】次に、下地金属めっき相10の表面10Aおよび超砥粒2の露出面に、次工程の無電解めっきにより金属の析出を促進するための表面触媒化処理を施す。これは、Au, Pt, Pd, Ag 等の貴金属触媒核を付与するための処理で、例えば$PdCl_2$等のような前記貴金属の塩溶液に、マスキングを施したままの台金1を浸漬し、水洗する。その際の処理溶液の濃度、温度、処理時間などの条件は、従来無電解めっきを行なっていた場合と同様でよい。

【0016】次いで、この台金1をNi, Cu 等の無電解めっき液に浸漬し、表面触媒化処理を施した下地金属めっき相10および超砥粒2の表面に、上地金属めっき相11を析出させる。すると、この上地金属めっき相11は、各超砥粒2と下地金属めっき相10との間の凹面となる部分で相対的に成長速度が大きいため、図2に示すように、裾野がなだらかな山形状に超砥粒2を包み込み、各超砥粒2の中間の部分には凹部11Aが形成される。

【0017】個々の超砥粒2の周縁部において、上地金属めっき相11と下地金属めっき相10を合わせた平均肉厚D3は、超砥粒2の平均粒径の50～90％、望ましくは60～80％とされる。50％未満では十分な砥粒保持力が得られず、90％より大では使用時に十分なチップポケットの深さが確保できない。

【0018】また、超砥粒2の中間部分（凹部11A）において、上地金属めっき相11と下地金属めっき相10とを合わせた肉厚D2は、好ましくは平均粒径の10％以上になる範囲において、前記周縁部での平均肉厚D3よりも平均粒径の30以上小さく設定されている。周縁部での平均肉厚D3より30％以上小さくないと十分なチップポケット形成効果が得られない。また、肉厚D2が平均粒径の10％未満になると、砥粒保持力が小さく、使用に堪えないおそれを有する。

【0019】無電解めっきが終了したら、台金1をめっき槽から取り出して水洗し、マスキングを除去した後、必要に応じて一般砥石等によるドレッシングを施し、図3に示すように超砥粒2の頂点部分2Aの上地金属めっき相11を除去して使用に供する。

【0020】上記の製造方法で得られる電着砥石によれば、隣接する超砥粒2の中間に凹部11Aがそれぞれ形成されているから、これら凹部11Aがチップポケットとして作用し、研削によって生じた切粉を砥石の運動とともに排出し、切粉排出性を高めて砥粒層の目詰まりが生じにくい。したがって、ドレッシングの回数が少なくて済み、砥石寿命を延長することができる。

【0021】また、砥粒層形成面と直交する方向から見た個々の超砥粒2の周縁部において上地金属めっき相11が盛り上がり、超砥粒2を包み込んでいるため、全体としての金属めっき相（10＋11）の肉厚が小さくても砥粒保持力が大きく、砥粒脱落が少ない。また、研削時には超砥粒2の刃先2Aのみが露出し、それ以外の部分は全て上地金属めっき相11に包まれているので、刃先2Aで発生した熱は速やかに上地金属めっき相11を通じて台金1に逃され、熱の放散性が良好である。したがって、例えば乾式研削に使用した場合にも超砥粒2の過熱が防止でき、より厳しい研削条件を採用することが可能である。

【0022】さらに、超砥粒2の表面にも表面触媒化処理を施した後、無電解めっきを行なうので、上地金属めっき相11と超砥粒2との単位面積当たりの接合強度が電解めっき法で超砥粒を直接固定した場合よりも高く、この点からも砥粒保持力の向上が図れる。

【0023】なお、本発明に使用する台金は、ホイール型、カップ型、ブロック型、総型砥石用など、いかなる形状のものでもよいし、超砥粒の平均砥粒等も限定されない。

【0024】

【実験例】次に、実験例を挙げて本発明の効果を実証する。直径150mm、外周面幅6mmのホイール型台金の外周面に、前述のように各種粒径のダイヤモンド砥粒を電解めっき法を用いて下地金属めっき相で固着した。

【0025】次に、この台金を濃度200mg／l、温度30℃の塩化パラジウム水溶液に浸漬し、その表面に触媒化処理を施した。これを水洗した後、台金をNi無電解めっき液に浸漬し、上地金属めっき相を形成した。

【0026】一方、比較例として、前記と全く同じ台金に電解めっき法により各実施例と同じダイヤモンド砥粒を固着してそれぞれ電着砥石を製造したもの（比較例1，2－1，3－1，4－1）、および各実施例と製造方法が同じであるがD2とD3の差が20％であるもの

(比較例２－２，３－２，４－２）を作成した。

【００２７】次いで、上記各砥石を平面研削盤にセットし、ＦＲＰ試験片の乾式研削試験を行なった。試験片としては長さ１００ｍｍ×幅３０ｍｍのグラスファイバ複合エポキシ樹脂を用い、切り込み量は超砥粒の平均粒径に応じて変更した。送り速度は全て２０ｍ／分に統一した。

【００２８】そして、研削抵抗が増して平面研削盤の主軸駆動に要する電流量が１０Ａに達するまで上記研削を繰り返し、本発明品および比較例の砥石による研削全長の比を求めた。

【００２９】各砥石の肉厚Ｄ１，Ｄ２，Ｄ３および研削結果を表１に示す。Ｄ１～Ｄ３は使用した超砥粒の平均粒径に対する百分率で示した。また、「研削長比」とあるのは、各実施例による研削長と、その実施例に対応する各比較例による研削長との比を示している。

【００３０】

【表１】

| | 粒度（平均粒径） | Ｄ１ | Ｄ２ | Ｄ３ | 切込(mm) | 研削長比 |
|---|---|---|---|---|---|---|
| 実施例１ | ＃３０(780μm) | １０ | ２０ | ７０ | ０．６ | ――― |
| 比較例１ | ＃３０(780μm) | ―― | ７０ | ７０ | ０．６ | １０：１ |
| 実施例２ | ＃８０(250μm) | １０ | ２０ | ７０ | ０．３ | ――― |
| 比較例２－１ | ＃８０(250μm) | ―― | ７０ | ７０ | ０．３ | ６：１ |
| 比較例２－２ | ＃８０(250μm) | １０ | ５０ | ７０ | ０．３ | １．２：１ |
| 実施例３ | ＃１７０(100μm) | １０ | ２０ | ７０ | ０．１ | ――― |
| 比較例３－１ | ＃１７０(100μm) | ―― | ７０ | ７０ | ０．１ | ２：１ |
| 比較例３－２ | ＃１７０(100μm) | １０ | ５０ | ７０ | ０．１ | １．１：１ |
| 実施例４ | ＃２００(85μm) | １０ | ２０ | ７０ | ０．１ | ――― |
| 比較例４－１ | ＃２００(85μm) | ―― | ７０ | ７０ | ０．１ | ２：１ |
| 比較例４－２ | ＃２００(85μm) | １０ | ６０ | ７０ | ０．１ | １．１：１ |

【００３１】表１から明らかなように、本発明品では良好な目詰まり防止効果が得られ、比較例に比して格段に長い寿命を有していた。また、本発明の目詰まり防止効果は特に超砥粒の粒径が大きい場合に顕著であり、それに対して比較例はいずれも目詰まりが激しかった。

【００３２】

【発明の効果】以上説明したように、本発明に係わる電着砥石およびその製造方法によれば、隣接する超砥粒の間で金属めっき相の表面に凹部が形成されるため、この部分がチップポケットとなって砥石の運動とともに切粉を研削部から排出し、高い切粉排出性が得られる。したがって砥粒層が目詰まりしにくく、ドレッシング頻度を低減して、砥石の稼動率および砥石寿命を延長することが可能である。

【００３３】また、砥粒層形成面と直交する方向から見た個々の超砥粒の周縁部において金属めっき相が盛り上がり、超砥粒を包み込んでいるため、金属めっき相の実質的な肉厚が小さくても砥粒保持力が大きく、研削中の砥粒脱落が少ない。さらに、超砥粒の研削に直接関与する刃先以外の部分は全て上地金属めっき相に包まれているので、刃先で発生した熱は、上地金属めっき相を通じて速やかに台金に逃され、乾式研削等に使用した場合にも超砥粒の過熱が生じにくいという利点を有する。

【図面の簡単な説明】

【図１】本発明に係わる電着砥石の製造方法を示す砥粒層の断面拡大図である。

【図２】本発明に係わる電着砥石の製造方法を示す砥粒層の断面拡大図である。

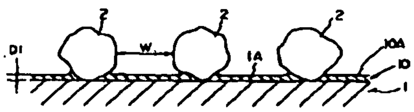
【図３】本発明に係わる電着砥石の製造方法を示す砥粒層の断面拡大図である。

【図４】従来の電着砥石の砥粒層の断面拡大図である。

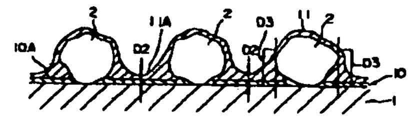
【符号の説明】

１　台金
１Ａ　砥粒層形成面
２　超砥粒
１０　下地金属めっき相
１１　上地金属めっき相
Ｄ１　下地金属めっき相の肉厚
Ｄ２　超砥粒同士の中間部での金属めっき相全体の肉厚
Ｄ３　超砥粒の周縁部での金属めっき相全体の肉厚

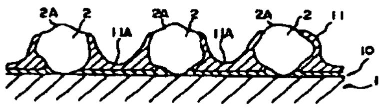
【図1】



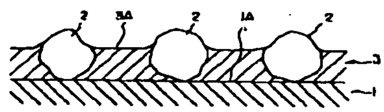

【図2】




【図3】




【図4】



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## CLAIMS

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[Claim(s)]
[Claim 1] The average wall thickness of the interstitial segment of the superabrasive which it is the electroplated grinding wheel which made the abrasive grain layer forming face of base metal fix superabrasive in the shape of a monolayer through a metal plating phase, and said metal plating phase has 50 - 90% of average wall thickness of the mean particle diameter of superabrasive in the periphery section of each superabrasive seen from the direction which intersects perpendicularly with said abrasive grain layer forming face, and adjoins, and suits is an electroplated grinding wheel characterized by said mean particle diameter being smaller than the average wall thickness in said periphery section 30% or more.
[Claim 2] While making the abrasive grain layer forming face of base metal distribute much superabrasives, to this abrasive grain layer forming face Form the substrate metal plating phase which has 0.3 - 20% of thickness of the mean particle diameter of superabrasive by the electrolysis galvanizing method or the nonelectrolytic plating method, and superabrasive is made to fix in the shape of a monolayer. The manufacture approach of the electroplated grinding wheel characterized by forming the Uechi metal plating phase in the front face of a substrate metal plating phase and superabrasive using a nonelectrolytic plating method after performing surface catalyst-ized processing to the front face of this substrate metal plating phase, and the exposure of superabrasive furthermore.

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[Translation done.]

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## DETAILED DESCRIPTION

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[Detailed Description of the Invention]
[0001]
[Industrial Application] With respect to the electroplated grinding wheel which fixed superabrasive to base metal with the metal plating phase, and its manufacture approach, especially, this invention forms a chip pocket in the front face of a metal plating phase, and relates to the amelioration for raising chip eccritic.
[0002]
[Description of the Prior Art] Drawing 4 is the cross-section enlarged drawing of an abrasive grain layer showing an example of the conventional electroplated grinding wheel. The sign 1 in drawing is base metal of various configurations, and much superabrasives 2 have fixed it in the shape of a monolayer through the metal plating phase 3 to abrasive grain layer forming face 1A of this base metal 1.
[0003] In order to form the metal plating phase 3, the electrolysis galvanizing method or a nonelectrolytic plating method is used. When based on the electrolysis galvanizing method, the base metal 1 which masked except for abrasive grain layer forming face 1A is immersed in electrolysis plating liquid, and a part of abrasive grain layer forming face 1A [ at least ] is arranged facing up and horizontally. And while scattering superabrasive 2 to this horizontal plane and connecting base metal 1 to power-source cathode, it energizes between the anode plates by which opposite arrangement was carried out with said horizontal plane, the metal plating phase 3 is deposited, and superabrasive 2 is fixed.
[0004] Moving base metal 1 for this actuation, the perimeter of abrasive grain layer forming face 1A is covered, and a monolayer-like abrasive grain layer is repeatedly formed in homogeneity. Also when using nonelectrolytic plating, nonelectrolytic plating liquid is used as plating liquid, and an anode plate performs the same actuation as the above except for the point which is not used.
[0005] In addition, also in any about 30 - 75% of mean particle diameter of superabrasive

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2 and case, the thickness of the metal plating phase 3 is usually set up. Abrasive grain holding power with this thickness sufficient at less than 30% is not acquired, but it drops out vainly [ superabrasive 2 ] in grinding, and the utilization ratio of superabrasive falls. Moreover, from 75%, in size, the amount of protrusions of the superabrasive 2 from the metal plating phase 3 is too small, and the problem that the amount of interlocking of the superabrasive 2 to **-ed material is insufficient, and sharpness falls remarkably arises.
[0006]
[Problem(s) to be Solved by the Invention] However, in the above electroplated grinding wheels, the effectiveness (chip eccritic) which discharges the chip which surface 3A of the metal plating phase 3 produced in grinding since it was precise and flat from a grinding part along with movement of a grinding stone is small. When superabrasive 2 was worn out and the amount of protrusions from the metal plating phase 3 became small especially, superabrasive 2 carried out blinding, sharpness fell extremely, grinding force increased rapidly, and the part and the use life of a grinding stone also had the fault of being short.
[0007]
[Means for Solving the Problem] Were made in order that this invention might solve the above-mentioned technical problem, and the electroplated grinding wheel concerning this invention first The abrasive grain layer forming face of base metal is made to fix superabrasive in the shape of a monolayer through a metal plating phase. Said metal plating phase It has 50 - 90% of average wall thickness of the mean particle diameter of superabrasive in the periphery section of each superabrasive seen from the direction which intersects perpendicularly with said abrasive grain layer forming face, and average wall thickness of the interstitial segment of the superabrasive which adjoins and suits is characterized by said mean particle diameter being smaller than the average wall thickness in said periphery section 30% or more.
[0008] Moreover, while the manufacture approach of this invention makes the abrasive grain layer forming face of base metal distribute much superabrasives Form in this abrasive grain layer forming face the substrate metal plating phase which has 0.3 - 20% of thickness of the mean particle diameter of superabrasive by the electrolysis galvanizing method or the nonelectrolytic plating method, and it is made to fix superabrasive in the shape of a monolayer. After performing surface catalyst-ized processing to the front face of this substrate metal plating phase, and the exposure of superabrasive furthermore, it is characterized by forming the Uechi metal plating phase in the front face of a substrate metal plating phase and superabrasive using a nonelectrolytic plating method.
[0009]
[Function] Since the crevice is formed in the front face of a metal plating phase between

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adjoining superabrasives according to this electroplated grinding wheel and its manufacture approach, this part serves as a chip pocket, a chip is discharged from the grinding section with movement of a grinding stone, and high chip eccritic is acquired. Therefore, it is possible to be hard to carry out blinding of the abrasive grain layer, and to extend the availability and the grinding stone life of a grinding stone.
[0010] Moreover, since the metal plating phase rose in the periphery section of each superabrasive seen from the direction which intersects perpendicularly with an abrasive grain layer forming face and superabrasive is wrapped in, even if the substantial thickness of a metal plating phase is small, abrasive grain holding power is large, and there are few abrasive grain crushing and abrasive grain omission in grinding. Furthermore, since all parts other than the edge of a blade which participates in the grinding of superabrasive directly are wrapped in the top metal group plating phase, the heat generated in the edge of a blade is promptly missed by base metal through the Uechi metal plating phase, and also when it is used for dry grinding etc., it can prevent overheating of superabrasive, and its cooling nature is good.
[0011]
[Example] Drawing 1 thru/or drawing 3 show the manufacture approach of the electroplated grinding wheel concerning this invention, the sign 1 in drawing is base metal, and 2 is superabrasive.
[0012] The base metal 1 which masked at the part except abrasive grain layer forming face 1A is set in a plating tub, and abrasive grain layer forming face 1A is made to distribute much superabrasives 2 first, by this approach, as shown in drawing 1 . And like the conventional method mentioned above in this field 1A, the substrate metal plating phase 10 is deposited by the electrolysis galvanizing method or the nonelectrolytic plating method, and temporary immobilization of the superabrasive 2 is carried out at the shape of a monolayer.
[0013] as the quality of the material of the substrate metal plating phase 10 -- nickel, Co, Cu, Zn, etc. -- usable -- the thick D1 -- the mean particle diameter of superabrasive 2 -- it may be 5 - 10% more preferably 0.3 to 20%. According to the experiment of this invention persons, if thick D1 is thinner than 0.3%, temporary immobilization of the superabrasive 2 cannot be carried out. Moreover, formation of the chip pocket which will be later mentioned if thicker than 20% becomes inadequate, and the blinding prevention effectiveness falls.
[0014] In addition, the average spacing W of superabrasive 2 comrades which adjoins and suits is settled in the range of about 0.7 to 1.5 times of the mean particle diameter of superabrasive 2, when the approach of scattering and electrodepositing superabrasive 2 on base metal 1 is taken.
[0015] Next, surface catalyst-ized processing for promoting a deposit of a metal with the

nonelectrolytic plating of degree process is performed to the exposure of surface 10A of the substrate metal plating phase 10, and superabrasive 2. this -- Au, Pt, Pd, and Ag etc. -- it is processing for giving a precious metal catalyst nucleus, for example, in salting in liquid of said noble metals like PdCl2 grade, it is immersed and base metal [ having masked ] 1 is rinsed. Conditions, such as concentration of the processing solution in that case, temperature, and the processing time, are the same as that of the case where nonelectrolytic plating is being performed conventionally, and are good.
[0016] subsequently, this base metal 1 -- nickel and Cu etc. -- it is immersed in nonelectrolytic plating liquid and the Uechi metal plating phase 11 is deposited on the front face of the substrate metal plating phase 10 and superabrasive 2 which performed surface catalyst-ized processing. Then, since the growth rate is large, as this Uechi metal plating phase 11 shows relatively drawing 2 in the part used as the concave surface between each superabrasive 2 and the substrate metal plating phase 10, superabrasive 2 is wrapped in in a crest configuration with gently-sloping Susono, and crevice 11A is formed in the middle part of each superabrasive 2.
[0017] the average wall thickness D3 which doubled the Uechi metal plating phase 11 and the substrate metal plating phase 10 in the periphery section of each superabrasive 2 -- the mean particle diameter of superabrasive 2 -- it may be 60 - 80% desirably 50 to 90%. Abrasive grain holding power sufficient at less than 50% is not acquired, and the depth of chip pocket sufficient at the time of use in size cannot be secured from 90%.
[0018] Moreover, in the interstitial segment (crevice 11A) of superabrasive 2, in the range which becomes 10% or more of mean particle diameter preferably, mean particle diameter is [ 30 or more ] smaller than the average wall thickness D3 in said periphery section, and thick D2 which doubled the Uechi metal plating phase 11 and the substrate metal plating phase 10 is set up. Unless it is smaller than the average wall thickness D3 in the periphery section 30% or more, sufficient chip-pocket formation effectiveness is not acquired. Moreover, when thick D2 becomes less than 10% of mean particle diameter, abrasive grain holding power is small and it has a possibility that use may not be borne.
[0019] If nonelectrolytic plating is completed, after taking out base metal 1 from a plating tub, rinsing it and removing masking, the dressing by a common grinding stone etc. is given if needed, as shown in drawing 3 , the Uechi metal plating phase 11 of top-most-vertices partial 2A of superabrasive 2 is removed, and use is presented.
[0020] According to the electroplated grinding wheel obtained by the above-mentioned manufacture approach, since crevice 11A is formed in the middle of the adjoining superabrasive 2, respectively, these crevice 11A acts as a chip pocket, and the chip produced by grinding is discharged with movement of a grinding stone, chip eccritic is raised, and it is hard to produce the blinding of an abrasive grain layer. Therefore, there are few counts of a dressing, and they end and a grinding stone life can be extended.

[0021] Moreover, since the Uechi metal plating phase 11 rose in the periphery section of each superabrasive 2 seen from the direction which intersects perpendicularly with an abrasive grain layer forming face and superabrasive 2 is wrapped in, even if the thickness of the metal plating phase (10+11) as the whole is small, abrasive grain holding power is large, and there are few abrasive grain omission. Moreover, since only edge-of-a-blade 2A of superabrasive 2 is exposed at the time of grinding and all the other parts are wrapped in the top metal group plating phase 11, the heat generated in edge-of-a-blade 2A is promptly missed by base metal 1 through the Uechi metal plating phase 11, and its divergence of heat is good. It is possible to be able to prevent overheating of superabrasive 2, also when it follows, for example, is used for dry grinding, and to adopt severer grinding conditions.
[0022] Furthermore, since nonelectrolytic plating is performed after performing surface catalyst-ized processing also to the front face of superabrasive 2, it is higher than the case where the bonding strength per unit area of the Uechi metal plating phase 11 and superabrasive 2 fixes superabrasive directly by the electrolysis galvanizing method, and improvement in abrasive grain holding power can be aimed at also from this point.
[0023] In addition, the thing of what kind of configurations, such as a wheel mold, a cup mold, a block type, and an object for compound-die grinding stones, is sufficient as the base metal used for this invention, and the average abrasive grain of superabrasive etc. is not limited.
[0024]
[Example(s) of Experiment] Next, the example of an experiment is given and the effectiveness of this invention is proved. To the peripheral face of wheel mold base metal with a diameter [ of 150mm ], and a peripheral face width of face of 6mm, as mentioned above, the electrolysis galvanizing method was used and the diamond abrasive grain of various particle size was fixed with the substrate metal plating phase.
[0025] Next, this base metal was immersed in concentration 200 mg/l and a palladium-chloride water solution with a temperature of 30 degrees C, and catalyst-ized processing was performed to that front face. After rinsing this, base metal was immersed in nickel nonelectrolytic plating liquid, and the Uechi metal plating phase was formed.
[0026] Although the thing (the example 1 of a comparison, 2-1, 3-1, 4-1) which, on the other hand, fixed the same diamond abrasive grain as each example by the electrolysis galvanizing method to the completely same base metal as the above as an example of a comparison, and manufactured the electroplated grinding wheel, respectively, and each example and the manufacture approach were the same, the difference of D2 and D3 created what is 20% (the example 2-2 of a comparison, 3-2, 4-2).
[0027] Subsequently, each above-mentioned grinding stone was set to the surface grinder, and the dry grinding trial of an FRP test piece was performed. The amount of

slitting was changed according to the mean particle diameter of superabrasive, using a glass fiber compound epoxy resin with a die-length [ of 100mm ] x width of face of 30mm as a test piece. All feed rates were unified into a part for 20m/.

[0028] And the above-mentioned grinding was repeated until the amount of currents which grinding force increases and the main shaft drive of a surface grinder takes reached 10A, and it asked for the ratio of the grinding overall length by the grinding stone of this invention article and the example of a comparison.

[0029] Thick D1 of each grinding stone, D2 and D3, and a grinding result are shown in Table 1. The percentage to the mean particle diameter of the used superabrasive showed D1-D3. Moreover, that it is with a "grinding length ratio" shows the ratio of the grinding length by each example, and the grinding length by each example of a comparison corresponding to the example.

[0030]

[Table 1]

| | 粒度（平均粒径） | D１ | D２ | D３ | 切込(mm) | 研削長比 |
|---|---|---|---|---|---|---|
| 実施例１ | ＃３０(780μm) | １０ | ２０ | ７０ | ０．５ | ――― |
| 比較例１ | ＃３０(780μm) | ―― | ７０ | ７０ | ０．５ | １０：１ |
| 実施例２ | ＃８０(250μm) | １０ | ２０ | ７０ | ０．３ | ――― |
| 比較例２－１ | ＃８０(250μm) | ―― | ７０ | ７０ | ０．３ | ６：１ |
| 比較例２－２ | ＃８０(250μm) | １０ | ５０ | ７０ | ０．３ | １．２：１ |
| 実施例３ | ＃１７０(100μm) | １０ | ２０ | ７０ | ０．１ | ――― |
| 比較例３－１ | ＃１７０(100μm) | ―― | ７０ | ７０ | ０．１ | ２：１ |
| 比較例３－２ | ＃１７０(100μm) | １０ | ５０ | ７０ | ０．１ | １．１：１ |
| 実施例４ | ＃２００(85μm) | １０ | ２０ | ７０ | ０．１ | ――― |
| 比較例４－１ | ＃２００(85μm) | ―― | ７０ | ７０ | ０．１ | ２：１ |
| 比較例４－２ | ＃２００(85μm) | １０ | ５０ | ７０ | ０．１ | １．１：１ |

[0031] in this invention article, the good blinding prevention effectiveness was acquired, and it was markedly alike as compared with the example of a comparison, and had the long life so that clearly from Table 1. Moreover, the blinding prevention effectiveness of this invention was remarkable when especially the particle size of superabrasive was large, and each example of a comparison had intense blinding to it.

[0032]

[Effect of the Invention] Since a crevice is formed in the front face of a metal plating phase between adjoining superabrasives according to the electroplated grinding wheel concerning this invention, and its manufacture approach as explained above, this part serves as a chip pocket, a chip is discharged from the grinding section with movement of

a grinding stone, and high [illegible]p eccritic is acquired. Therefore, it is possible to be hard to carry out blinding of the abrasive grain layer, to reduce dressing frequency, and to extend the availability and the grinding stone life of a grinding stone.
[0033] Moreover, since the metal plating phase rose in the periphery section of each superabrasive seen from the direction which intersects perpendicularly with an abrasive grain layer forming face and superabrasive is wrapped in, even if the substantial thickness of a metal plating phase is small, abrasive grain holding power is large, and there are few abrasive grain omission in grinding. Furthermore, since all parts other than the edge of a blade which participates in the grinding of superabrasive directly are wrapped in the top metal group plating phase, the heat generated in the edge of a blade is promptly missed by base metal through the Uechi metal plating phase, and also when it is used for dry grinding etc., it has the advantage of being hard to produce overheating of superabrasive.

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[Translation done.]

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TECHNICAL FIELD

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[Industrial Application] With respect to the electroplated grinding wheel which fixed superabrasive to base metal with the metal plating phase, and its manufacture approach, especially, this invention forms a chip pocket in the front face of a metal plating phase, and relates to the amelioration for raising chip eccritic.

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[Translation done.]

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## PRIOR ART

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[Description of the Prior Art] Drawing 4 is the cross-section enlarged drawing of an abrasive grain layer showing an example of the conventional electroplated grinding wheel. The sign 1 in drawing is base metal of various configurations, and much superabrasives 2 have fixed it in the shape of a monolayer through the metal plating phase 3 to abrasive grain layer forming face 1A of this base metal 1.
[0003] In order to form the metal plating phase 3, the electrolysis galvanizing method or a nonelectrolytic plating method is used. When based on the electrolysis galvanizing method, the base metal 1 which masked except for abrasive grain layer forming face 1A is immersed in electrolysis plating liquid, and a part of abrasive grain layer forming face 1A [ at least ] is arranged facing up and horizontally. And while scattering superabrasive 2 to this horizontal plane and connecting base metal 1 to power-source cathode, it energizes between the anode plates by which opposite arrangement was carried out with said horizontal plane, the metal plating phase 3 is deposited, and superabrasive 2 is fixed.
[0004] Moving base metal 1 for this actuation, the perimeter of abrasive grain layer forming face 1A is covered, and a monolayer-like abrasive grain layer is repeatedly formed in homogeneity. Also when using nonelectrolytic plating, nonelectrolytic plating liquid is used as plating liquid, and an anode plate performs the same actuation as the above except for the point which is not used.
[0005] In addition, also in any about 30 - 75% of mean particle diameter of superabrasive 2 and case, the thickness of the metal plating phase 3 is usually set up. Abrasive grain holding power with this thickness sufficient at less than 30% is not acquired, but it drops out vainly [ superabrasive 2 ] in grinding, and the utilization ratio of superabrasive falls. Moreover, from 75%, in size, the amount of protrusions of the superabrasive 2 from the metal plating phase 3 is too small, and the problem that the amount of interlocking of the superabrasive 2 to **-ed material is insufficient, and sharpness falls remarkably arises.

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[Translation done.]

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EFFECT OF THE INVENTION

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[Effect of the Invention] Since a crevice is formed in the front face of a metal plating phase between adjoining superabrasives according to the electroplated grinding wheel concerning this invention, and its manufacture approach as explained above, this part serves as a chip pocket, a chip is discharged from the grinding section with movement of a grinding stone, and high chip eccritic is acquired. Therefore, it is possible to be hard to carry out blinding of the abrasive grain layer, to reduce dressing frequency, and to extend the availability and the grinding stone life of a grinding stone.
[0033] Moreover, since the metal plating phase rose in the periphery section of each superabrasive seen from the direction which intersects perpendicularly with an abrasive grain layer forming face and superabrasive is wrapped in, even if the substantial thickness of a metal plating phase is small, abrasive grain holding power is large, and there are few abrasive grain omission in grinding. Furthermore, since all parts other than the edge of a blade which participates in the grinding of superabrasive directly are wrapped in the top metal group plating phase, the heat generated in the edge of a blade is promptly missed by base metal through the Uechi metal plating phase, and also when it is used for dry grinding etc., it has the advantage of being hard to produce overheating of superabrasive.

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[Translation done.]

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## TECHNICAL PROBLEM

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[Problem(s) to be Solved by the Invention] However, in the above electroplated grinding wheels, the effectiveness (chip eccritic) which discharges the chip which surface 3A of the metal plating phase 3 produced in grinding since it was precise and flat from a grinding part along with movement of a grinding stone is small. When superabrasive 2 was worn out and the amount of protrusions from the metal plating phase 3 became small especially, superabrasive 2 carried out blinding, sharpness fell extremely, grinding force increased rapidly, and the part and the use life of a grinding stone also had the fault of being short.

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[Translation done.]

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MEANS

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[Means for Solving the Problem] Were made in order that this invention might solve the above-mentioned technical problem, and the electroplated grinding wheel concerning this invention first The abrasive grain layer forming face of base metal is made to fix superabrasive in the shape of a monolayer through a metal plating phase. Said metal plating phase It has 50 - 90% of average wall thickness of the mean particle diameter of superabrasive in the periphery section of each superabrasive seen from the direction which intersects perpendicularly with said abrasive grain layer forming face, and average wall thickness of the interstitial segment of the superabrasive which adjoins and suits is characterized by said mean particle diameter being smaller than the average wall thickness in said periphery section 30% or more.
[0008] Moreover, while the manufacture approach of this invention makes the abrasive grain layer forming face of base metal distribute much superabrasives Form in this abrasive grain layer forming face the substrate metal plating phase which has 0.3 - 20% of thickness of the mean particle diameter of superabrasive by the electrolysis galvanizing method or the nonelectrolytic plating method, and it is made to fix superabrasive in the shape of a monolayer. After performing surface catalyst-ized processing to the front face of this substrate metal plating phase, and the exposure of superabrasive furthermore, it is characterized by forming the Uechi metal plating phase in the front face of a substrate metal plating phase and superabrasive using a nonelectrolytic plating method.

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[Translation done.]

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## OPERATION

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[Function] Since the crevice is formed in the front face of a metal plating phase between adjoining superabrasives according to this electroplated grinding wheel and its manufacture approach, this part serves as a chip pocket, a chip is discharged from the grinding section with movement of a grinding stone, and high chip eccritic is acquired. Therefore, it is possible to be hard to carry out blinding of the abrasive grain layer, and to extend the availability and the grinding stone life of a grinding stone.
[0010] Moreover, since the metal plating phase rose in the periphery section of each superabrasive seen from the direction which intersects perpendicularly with an abrasive grain layer forming face and superabrasive is wrapped in, even if the substantial thickness of a metal plating phase is small, abrasive grain holding power is large, and there are few abrasive grain crushing and abrasive grain omission in grinding. Furthermore, since all parts other than the edge of a blade which participates in the grinding of superabrasive directly are wrapped in the top metal group plating phase, the heat generated in the edge of a blade is promptly missed by base metal through the Uechi metal plating phase, and also when it is used for dry grinding etc., it can prevent overheating of superabrasive, and its cooling nature is good.

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[Translation done.]

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## EXAMPLE

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[Example] Drawing 1 thru/or drawing 3 show the manufacture approach of the electroplated grinding wheel concerning this invention, the sign 1 in drawing is base metal, and 2 is superabrasive.
[0012] The base metal 1 which masked at the part except abrasive grain layer forming face 1A is set in a plating tub, and abrasive grain layer forming face 1A is made to distribute much superabrasives 2 first, by this approach, as shown in drawing 1 . And like the conventional method mentioned above in this field 1A, the substrate metal plating phase 10 is deposited by the electrolysis galvanizing method or the nonelectrolytic plating method, and temporary immobilization of the superabrasive 2 is carried out at the shape of a monolayer.
[0013] as the quality of the material of the substrate metal plating phase 10 -- nickel, Co, Cu, Zn, etc. -- usable -- the thick D1 -- the mean particle diameter of superabrasive 2 -- it may be 5 - 10% more preferably 0.3 to 20%. According to the experiment of this invention persons, if thick D1 is thinner than 0.3%, temporary immobilization of the superabrasive 2 cannot be carried out. Moreover, formation of the chip pocket which will be later mentioned if thicker than 20% becomes inadequate, and the blinding prevention effectiveness falls.
[0014] In addition, the average spacing W of superabrasive 2 comrades which adjoins and suits is settled in the range of about 0.7 to 1.5 times of the mean particle diameter of superabrasive 2, when the approach of scattering and electrodepositing superabrasive 2 on base metal 1 is taken.
[0015] Next, surface catalyst-ized processing for promoting a deposit of a metal with the nonelectrolytic plating of degree process is performed to the exposure of surface 10A of the substrate metal plating phase 10, and superabrasive 2. this -- Au, Pt, Pd, and Ag etc. -- it is processing for giving a precious metal catalyst nucleus, for example, in salting in liquid of said noble metals like PdCl2 grade, it is immersed and base metal [ having

masked ] 1 is rinsed. Conditions, such as concentration of the processing solution in that case, temperature, and the processing time, are the same as that of the case where nonelectrolytic plating is being performed conventionally, and are good.
[0016] subsequently, this base metal 1 -- nickel and Cu etc. -- it is immersed in nonelectrolytic plating liquid and the Uechi metal plating phase 11 is deposited on the front face of the substrate metal plating phase 10 and superabrasive 2 which performed surface catalyst-ized processing. Then, since the growth rate is large, as this Uechi metal plating phase 11 shows relatively drawing 2 in the part used as the concave surface between each superabrasive 2 and the substrate metal plating phase 10, superabrasive 2 is wrapped in in a crest configuration with gently-sloping Susono, and crevice 11A is formed in the middle part of each superabrasive 2.
[0017] the average wall thickness D3 which doubled the Uechi metal plating phase 11 and the substrate metal plating phase 10 in the periphery section of each superabrasive 2 -- the mean particle diameter of superabrasive 2 -- it may be 60 - 80% desirably 50 to 90%. Abrasive grain holding power sufficient at less than 50% is not acquired, and the depth of chip pocket sufficient at the time of use in size cannot be secured from 90%.
[0018] Moreover, in the interstitial segment (crevice 11A) of superabrasive 2, in the range which becomes 10% or more of mean particle diameter preferably, mean particle diameter is [ 30 or more ] smaller than the average wall thickness D3 in said periphery section, and thick D2 which doubled the Uechi metal plating phase 11 and the substrate metal plating phase 10 is set up. Unless it is smaller than the average wall thickness D3 in the periphery section 30% or more, sufficient chip-pocket formation effectiveness is not acquired. Moreover, when thick D2 becomes less than 10% of mean particle diameter, abrasive grain holding power is small and it has a possibility that use may not be borne.
[0019] If nonelectrolytic plating is completed, after taking out base metal 1 from a plating tub, rinsing it and removing masking, the dressing by a common grinding stone etc. is given if needed, as shown in drawing 3 , the Uechi metal plating phase 11 of top-most-vertices partial 2A of superabrasive 2 is removed, and use is presented.
[0020] According to the electroplated grinding wheel obtained by the above-mentioned manufacture approach, since crevice 11A is formed in the middle of the adjoining superabrasive 2, respectively, these crevice 11A acts as a chip pocket, and the chip produced by grinding is discharged with movement of a grinding stone, chip eccritic is raised, and it is hard to produce the blinding of an abrasive grain layer. Therefore, there are few counts of a dressing, and they end and a grinding stone life can be extended.
[0021] Moreover, since the Uechi metal plating phase 11 rose in the periphery section of each superabrasive 2 seen from the direction which intersects perpendicularly with an abrasive grain layer forming face and superabrasive 2 is wrapped in, even if the thickness of the metal plating phase (10+11) as the whole is small, abrasive grain holding power is

large, and there are few abrasive grain omission. Moreover, since only edge-of-a-blade 2A of superabrasive 2 is exposed at the time of grinding and all the other parts are wrapped in the top metal group plating phase 11, the heat generated in edge-of-a-blade 2A is promptly missed by base metal 1 through the Uechi metal plating phase 11, and its divergence of heat is good. It is possible to be able to prevent overheating of superabrasive 2, also when it follows, for example, is used for dry grinding, and to adopt severer grinding conditions.

[0022] Furthermore, since nonelectrolytic plating is performed after performing surface catalyst-ized processing also to the front face of superabrasive 2, it is higher than the case where the bonding strength per unit area of the Uechi metal plating phase 11 and superabrasive 2 fixes superabrasive directly by the electrolysis galvanizing method, and improvement in abrasive grain holding power can be aimed at also from this point.

[0023] In addition, the thing of what kind of configurations, such as a wheel mold, a cup mold, a block type, and an object for compound-die grinding stones, is sufficient as the base metal used for this invention, and the average abrasive grain of superabrasive etc. is not limited.

[0024]

[Example(s) of Experiment] Next, the example of an experiment is given and the effectiveness of this invention is proved. To the peripheral face of wheel mold base metal with a diameter [ of 150mm ], and a peripheral face width of face of 6mm, as mentioned above, the electrolysis galvanizing method was used and the diamond abrasive grain of various particle size was fixed with the substrate metal plating phase.

[0025] Next, this base metal was immersed in concentration 200 mg/l and a palladium-chloride water solution with a temperature of 30 degrees C, and catalyst-ized processing was performed to that front face. After rinsing this, base metal was immersed in nickel nonelectrolytic plating liquid, and the Uechi metal plating phase was formed.

[0026] Although the thing (the example 1 of a comparison, 2-1, 3-1, 4-1) which, on the other hand, fixed the same diamond abrasive grain as each example by the electrolysis galvanizing method to the completely same base metal as the above as an example of a comparison, and manufactured the electroplated grinding wheel, respectively, and each example and the manufacture approach were the same, the difference of D2 and D3 created what is 20% (the example 2-2 of a comparison, 3-2, 4-2).

[0027] Subsequently, each above-mentioned grinding stone was set to the surface grinder, and the dry grinding trial of an FRP test piece was performed. The amount of slitting was changed according to the mean particle diameter of superabrasive, using a glass fiber compound epoxy resin with a die-length [ of 100mm ] x width of face of 30mm as a test piece. All feed rates were unified into a part for 20m/.

[0028] And the above-mentioned grinding was repeated until the amount of currents

which grinding force increases and the main shaft drive of a surface grinder takes reached 10A, and it asked for the ratio of the grinding overall length by the grinding stone of this invention article and the example of a comparison.

[0029] Thick D1 of each grinding stone, D2 and D3, and a grinding result are shown in Table 1. The percentage to the mean particle diameter of the used superabrasive showed D1-D3. Moreover, that it is with a "grinding length ratio" shows the ratio of the grinding length by each example, and the grinding length by each example of a comparison corresponding to the example.

[0030]

[Table 1]

| | 粒度（平均粒径） | D１ | D２ | D３ | 切込(mm) | 研削長比 |
|---|---|---|---|---|---|---|
| 実施例１ | ＃３０(780μm) | １０ | ２０ | ７０ | ０．５ | ――― |
| 比較例１ | ＃３０(780μm) | ―― | ７０ | ７０ | ０．５ | １０：１ |
| 実施例２ | ＃８０(250μm) | １０ | ２０ | ７０ | ０．３ | ――― |
| 比較例２－１ | ＃８０(250μm) | ―― | ７０ | ７０ | ０．３ | ６：１ |
| 比較例２－２ | ＃８０(250μm) | １０ | ５０ | ７０ | ０．３ | １．２：１ |
| 実施例３ | ＃１７０(100μm) | １０ | ２０ | ７０ | ０．１ | ――― |
| 比較例３－１ | ＃１７０(100μm) | ―― | ７０ | ７０ | ０．１ | ２：１ |
| 比較例３－２ | ＃１７０(100μm) | １０ | ５０ | ７０ | ０．１ | １．１：１ |
| 実施例４ | ＃２００(85μm) | １０ | ２０ | ７０ | ０．１ | ――― |
| 比較例４－１ | ＃２００(85μm) | ―― | ７０ | ７０ | ０．１ | ２：１ |
| 比較例４－２ | ＃２００(85μm) | １０ | ５０ | ７０ | ０．１ | １．１：１ |

[0031] in this invention article, the good blinding prevention effectiveness was acquired, and it was markedly alike as compared with the example of a comparison, and had the long life so that clearly from Table 1. Moreover, the blinding prevention effectiveness of this invention was remarkable when especially the particle size of superabrasive was large, and each example of a comparison had intense blinding to it.

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[Translation done.]

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## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]
[Drawing 1] It is the cross-section enlarged drawing of an abrasive grain layer showing the manufacture approach of the electroplated grinding wheel concerning this invention.
[Drawing 2] It is the cross-section enlarged drawing of an abrasive grain layer showing the manufacture approach of the electroplated grinding wheel concerning this invention.
[Drawing 3] It is the cross-section enlarged drawing of an abrasive grain layer showing the manufacture approach of the electroplated grinding wheel concerning this invention.
[Drawing 4] It is the cross-section enlarged drawing of the abrasive grain layer of the conventional electroplated grinding wheel.
[Description of Notations]
1 Base Metal
1A Abrasive grain layer forming face
2 Superabrasive
10 Substrate Metal Plating Phase
11 Uechi Metal Plating Phase
D1 Thickness of a substrate metal plating phase
D2 Thickness of the whole metal plating phase in the pars intermedia of superabrasives
D3 Thickness of the whole metal plating phase in the periphery section of superabrasive

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[Translation done.]

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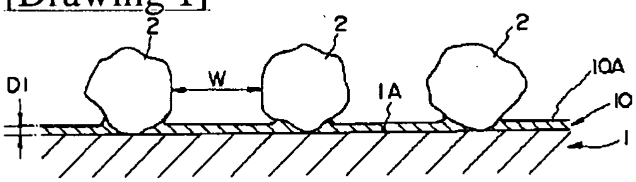
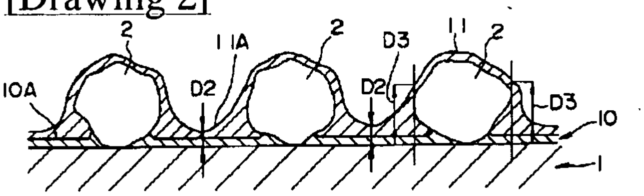
## DRAWINGS

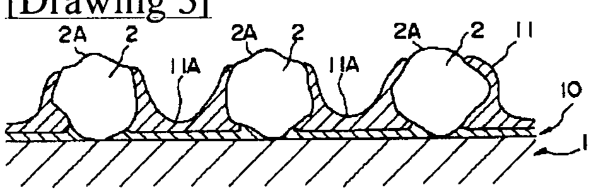
[Drawing 1]



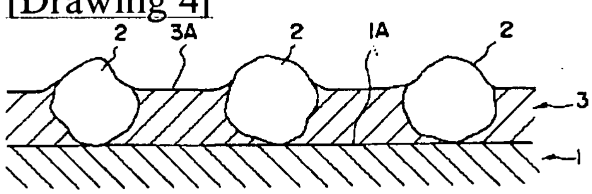

[Drawing 2]




[Drawing 3]




[Drawing 4]

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